

Examiner Chester T. Barry
Appln. of Redmon et al.
Ser. No.: 10/667,893
Response of 9/5/2006

CLEAN COPY OF AMENDED CLAIMS

1. A method of controlling a biological wastewater treatment process, comprising:
 - A. in at least one treatment tank containing wastewater and having associated therewith at least one device to supply an increasing and decreasing flow of oxygen-containing gas and/or wastewater into the tank, conducting a biological process wherein the need for oxygen in the process repeatedly increases and decreases during the process,
 - B. supporting the process at least in part by introducing the oxygen-containing gas into the wastewater in the form of bubbles provided in the wastewater by a gas supply system, and causing at least a portion of the oxygen in the bubbles to dissolve in the wastewater and at least a portion of the dissolved oxygen to be consumed by the biological process
 1. wherein the oxygen so dissolved may represent an excess or a deficiency relative to the oxygen consumed by the biological process, and
 2. wherein at least one gas collection member is positioned to receive offgas representing gas from said bubbles that has not been dissolved into the wastewater;
 - C. controlling the operation of the biological process with a control system that, as the process operates, exercises continuing control over the process at least partially in response to

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1. offgas measurements that are taken by the control system from the offgas collected in the gas collection member and that are correlative with changing amounts of one or more gases in the offgas, and
 2. DO data correlative with varying DO levels in the wastewater and/or performance data correlative with varying ability of the gas supply system to transfer oxygen to the wastewater;
- D. utilizing said measurements and data to provide, in the control system, control values, which may be components of control values, and which include
1. first control values, comprising requirements control values, that change in response to, while remaining correlative with, the need for oxygen in the process, and
 2. second control values, comprising DO control values and/or performance control values that change in response to, while remaining correlative with, respectively, DO levels in the wastewater and/or the varying ability of the gas supply system to transfer oxygen to the wastewater; and
- E. deriving, in the control system, utilizing said first and second control values, control signals for adjusting said at least one device.
2. A method of controlling a wastewater treatment process according to claim 1 wherein the control system exercises continuing control over the amount of gas discharged into the tank and repeatedly increases and decreases that amount, during the process, as the need for oxygen varies, and the control signals derived in the control system are based at least in part on

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offgas measurements, DO data and performance data and are utilized to control the amount of gas discharged into the tank through said gas supply system.

3. A control system for controlling wastewater treatment apparatus that comprises at least one tank to contain and treat wastewater in a biological process, at least one device to supply an increasing and decreasing flow of an oxygen-containing gas into the wastewater to support the process, a gas supply system to introduce the gas into the wastewater as bubbles and cause at least a portion of the oxygen in the bubbles to dissolve in the wastewater and be at least partly consumed by the process and at least one gas collection member positioned to receive offgas from the wastewater; said control system comprising the combination of:
 - A. at least one gas detector that can take offgas measurements correlative with varying amounts of at least one gas collected in the gas collection member,
 - B. at least one DO (dissolved oxygen) detector that, when in contact with the wastewater in the tank, can take DO measurements of the DO levels of the wastewater, and
 - C. at least one controller
 1. which contains or has access to code which the controller can utilize with the offgas measurements and DO measurements to provide, in the control system, varying control values, which may be components of control values, that are

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- a. at least in part correlative with repeatedly fluctuating requirements for oxygen-containing gas flow to support the biological process and
 - b. at least in part correlative with such varying positive or negative adjustment of the oxygen-containing gas flow as may be needed to cause the wastewater DO levels to move toward, return to or be maintained at a target value, and
2. which derives control signals, based at least in part on said control values, to which the at least one device is responsive.
4. A control system according to claim 3 wherein the at least one controller contains or has access to additional code which the controller can utilize with performance data to provide, in the control system, varying additional control values, which may be components of control values, correlative with the varying ability of the gas supply system to transfer oxygen to the wastewater, and wherein the additional code is configured to apply the additional control values in combination with the first-mentioned control values in deriving the control signals.